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USSR Report

SCIENCE AND TECHNOLOGY POLICY

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USSR REPORT

SCIENCE AND TECHNOLOGY POLICY

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ORGANIZATION, PLANNING AND COORDINATION

SPECIALIZED ECONOMIC INTRODUCING SERVICES PROPOSED

Moscow SOTSIALISTICHESKIY TRUD in Russian No 11, Nov 85 pp 51-53

[Article by Yu. Alishauskas, director of an economic research group of the Institute of Physics of the Lithuanian SSR Academy of Sciences: "Specialized Economic Introducing Services Are Needed"]

[Text] At the present stage of the development of the national economy the retooling of physical production is playing a greater and greater role. "The unified scientific and technical policy is now assuming decisive importance," it was noted at the June (1983) CPSU Central Committee Plenum. "Enormous work on the development of machines, mechanisms, and technologies of both today and tomorrow awaits us. The automation of production has to be carried out, the most extensive use of computers and robots and the introduction of flexible technology, which makes it possible to change production over rapidly and efficiently to the output of new products, have to be ensured."

The implementation of these instructions in the republic made it possible to ensure a high rate of development of physical production, to increase the efficiency of new equipment, and to achieve a significant saving of material and manpower resources. Thus, already in 1983 the volume of industrial output in the Lithuanian SSR came to 10,239 million rubles--13 percent more than in 1980, labor productivity during the same period increased by 11 percent, the economic impact from the use of new equipment came to 67.8 million rubles.

When improving the organization of scientific labor, it is important first of all to decrease the expenditures of time of researchers and developers on technical and auxiliary operations. For example, when analyzing the organization of labor at academic institutes of the republic it was established that technical operations account for 30-50 percent of the working time of scientists. It is especially important to increase the efficiency of the division of labor when performing economic contractual operations. The point is that the cases, when scientists themselves are forced to establish economic relations between the client and the performer, are frequent. This, on the one hand, diverts them from the performance of their basic functions and, on the other, as a consequence of their inadequate skill in this area frequently leads to all kinds of violations of financial discipline. For example, at a number of scientific institutions up to 30 percent of the economic contractual agreements have an obviously overstated estimated cost

for the item "wages," while in several instances the assets, which are intended for these purposes, are being spent for the wrong purpose.

In solving such problems, it would be advisable to establish at scientific research institutions specialized technical and economic subdivisions, the task of which would be to prepare, debug, and adapt scientific and technical developments to specific production technological conditions and to advertise the developed innovations for the purpose of introduction in the national economy of the country or the sale of licenses abroad. These subdivisions will, moreover, draw up and disseminate technical and economic documents for those who wish to acquire the created developments. The organization of the internal economic activity of the scientific research institution, as well as the conclusion and fulfillment of economic contracts and the transfer of the achieved positive results to the client will be included in their functions.

Of course, the formation at scientific research and experimental design institutions of technical and economic subdivisions of this sort will be justified only if all scientists are freed from technical and auxiliary operations. This is entirely possible, if it is taken into account that at many scientific research institutions technical and auxiliary personnel make up in some instances 60-70 percent of the total number of associates.

At the given stage of the development of the national economy when improving the organization of scientific labor it is advisable to set up centralized introducing and economic services in conformity with the specific nature of the specific scientific research institution and the national economic goals being posed for it. The formation of such services will make it possible to make a preliminary economic evaluation of scientific research and experimental design work, which will ensure the choice among them of the most necessary ones for the national economy, will speed up the time of performance, and will improve the supply with material, manpower, and financial resources. The particular urgency of the organization of specialized introducing and economic services at scientific research institutions and organizations is coming to light in case of the significant and ever increasing amounts of themes, which are being performed on an economic contractual basis. Thus, at the Institute of Physics of the Lithuanian SSR Academy of Sciences such operations in 1983 accounted for 75 percent of the total amount of financing. Owing to the establishment of a specialized introducing and economic service an annual economic impact from the introduction of scientific and technical innovations in the national economy of more than 1 million rubles was achieved here during the same year.

In the future it is advisable to develop specialized introducing and economic services so that they would completely ensure the management of the economic activity of the scientific research institution. Here the scientific subdivisions would be freed from 80-90 percent of the economic operations and would be concerned only with the overall monitoring of their implementation, which would make it possible to a significant degree to stimulate scientific research.

A substantial reserve of the increase of the efficiency of scientific labor is the more efficient use of the system of material incentives for the achieved

results, moreover, the specialized introducing and economic services should play a decisive role here as well. They are obliged to substantiate the payment of the material reward to scientific research, technical, and auxiliary personnel in conformity with the national economic importance of the achieved results and the contribution of each worker to one innovation or another.

While improving the organization of scientific research, it is important to improve the activity of patent and license services. This requirement stems from the fact that in recent times the creative activeness of inventors and the national economic significance of the achieved scientific and technical results have been decreasing. For example, in 1983 in the Lithuanian SSR as compared with 1982 the number of authors of inventions and efficiency proposals decreased by 1,000, the number of applications for inventions and efficiency proposals decreased by 300, while the achieved economic impact from the introduction in production of inventions and efficiency proposals decreased by 3.5 million rubles.

One of the causes of the decrease of the creative activeness of inventors and efficiency experts, in our opinion, consists in the fact that when drawing up and submitting applications the deadlines are significantly exceeded and the procedural requirements are violated. At many scientific research institutions the patent and license services are insufficiently developed, which hinders the timely identification and registration of potential inventions. In particular, the excessive workload of the centers of technical information services, in which, as surveys showed, the applications for inventions are drawn up for the client enterprise with the exceeding of the deadlines, which are indicated in USSR legislation on invention, by two- to threefold, attests to this.

When solving these problems it is advisable to involve socially active people more extensively in patent and license activity, which will make it possible to shorten the time of the drawing up of applications, as well as to ensure the participation of highly skilled specialists in this work. In order to increase their activeness, a material reward should be paid to them for each scientific and technical innovation which is recognized as an invention. In particular, it is possible to pay them bonuses on the basis of the Statute on the Payment of Bonuses to Workers of Enterprises and Organizations for the Development and Introduction of New Equipment, which was approved by the decree of the State Committee of the USSR Council of Ministers for Labor and Wages and the Presidium of the All-Union Central Council of Trade Unions of 26 December 1964 (with subsequent changes).

The efficiency of scientific labor can be increased appreciably as a result of better information supply. Scientific associates spend up to 20 percent of the time, which is consumed for the performance of scientific research work as a whole, for these purposes. It would be advisable to organize the comprehensive giving of information on a given heading. Given such a system scientific associates could present to the information service the themes which interest them, while the workers of the information services would report to the client in conformity with his application descriptions of inventions, a list of the developments of a similar type, which are in use in

the national economy, the standards, and a bibliography on the given questions. In addition, reports on completed scientific research work and a list of measures, which it is proposed to organize in the given area (conferences, exhibitions, and so forth), can be made available. As a whole the system of the comprehensive provision of information would make it possible to decrease the expenditures of time of scientists on becoming acquainted with information sources to one-third to one-half.

It is advisable to improve the organization of scientific labor comprehensively, by identifying the most promising directions of this process and combining them with advanced organizational and economic achievements.

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ORGANIZATION, PLANNING AND COORDINATION

ORGANIZATIONAL RESERVES OF PROGRESS IN MINING INDUSTRY

Moscow SOTSIALISTICHESKIY TRUD in Russian No 11, Nov 85 pp 53-57

[Article by I. Dreytser, the Kuznetsk Affiliate of the Scientific Research Institute of Open-Cut Mining: "The Organizational Reserves of the Acceleration of Scientific and Technical Progress"]

[Text] At the June conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress the insufficiently high efficiency of our applied science, especially sectorial science, was noted. When analyzing the causes of its lag, one should, in our opinion, take into account all the components of the complex "science--production" system, through which scientific and technical progress in sectors is realized. Within the "science" subsystem, obviously, it is advisable to single out all the factors which have the greatest influence on the efficient use of the scientific and technical potential. Among them probably the prime one is connected with the technical and economic evaluation of the basic directions (planned results) of research and development (NIOKR).

To what extent does the existing procedure of defending the drafts of the plan of research (NIR) make it possible to establish a reliable barrier against themes with a poor technical and economic potential? It is not a matter of those instances, when institutes are ordered to perform operations which do not have anything in common with science, when scientific subdivisions in essence become a continuation of the staff of the ministry. No one is denying that such operations are needed, but why reckon them with respect to the department of science? The plan of our institute usually contains themes which are entirely within the capability of the corresponding services of production associations (it seems that no sectorial institute has been passed over by such "attention"). And at enterprises, in addition to line personnel, there are enough engineering and technical personnel, to whom such work (like, say, the preparation of operating and repair documents for imported equipment, the calculation of the need for equipment, and others) can be assigned in accordance with their engineering status.

But even resourceful themes, as a rule, do not undergo serious appraisal. Moreover, today there is no reliable organizational and economic mechanism which makes it possible to obtain an objective outside opinion of already completed research. The technical services of the corresponding

administrations of the ministry are usually small, and the curator of the institute, although he may be as wise as Solomon, is not physically capable of making a circumstantial appraisal. If, moreover, it is recalled that the thematic plans have a wide subject range, there are also no grounds to require of the curator the necessary depth of analysis. Perhaps, for this reason, the system of expert self-service in science, when along with the work being sent for an opinion its finished text, which merely has to be signed (even the corresponding term--"blank"--has been established), is also sent, blossomed so luxuriantly.

It is quite clear that such a method of evaluating research can hardly contribute to the increase of the efficiency of research. It is all the more important to ensure an objective appraisal at the stage of the planning of themes, when it is possible to prevent the appearance, to put it mildly, of not very promising operations. From this standpoint it is advisable, apparently, to reinterpret somewhat the very approach to the determination of the strategic issues of the planning of the scientific and technical development of the sector and to outline means of shifting from extensive to intensive methods. A classical example of extensive development is the increase of the unit power (performance) of machines, equipment, and units. In open-cut mining, in particular, this found expression in the significant increase of the capacity of the bucket of excavators, the load-carrying capacity of dump trucks and locomotive trains, the output of drilling rigs. As a result for the Kemerovo Coal Association alone during the past decade (1970-1980) the average annual output of a power shovel increased from 842,000 to 1,035,000 cubic meters, a dragline--from 1,437,000 to 2 million cubic meters, a drilling rig--from 24,000 to 35,000 meters, a truck--from 145,000 to 303,000 tons, a locomotive train--from 686,000 to 846,000 cubic meters.

However, for all the advantages of such a means it is nevertheless not free of shortcomings. First of all it is impossible to increase infinitely the unit power of machines, since at a specific stage (a not so distant one) such a benefit of retooling turns into an economic evil: the labor intensiveness of the installation and the "cost" of idle times of equipment and its difficulty of repair increase, the maneuverability decreases, finally, it is also impossible not to take into account the leading increase of power consumption and the worsening of the economic indicators. The main thing is that equipment with increased parameters of output in essence does not change the structure of production and no labor-consuming technological process is eliminated from it. For example, under the conditions of open-cut mining the drilling and blasting preparation of the body of rock continues to be retained.

Meanwhile starting in the late 1960's the Institute of Mining imeni A.A. Skochinskiy (later the Kuznetsk Affiliate of the Scientific Research Institute of Open-Cut Mining joined it) began to develop a range of fundamentally new mining machines which use explosion-pulse drive. One of them is the explosion bulldozer. The use of such equipment in principle makes it possible to eliminate from coal mining technology the drilling and blasting preparation of the body of rock. It would seem that these qualities of the new machine should have speeded up that section of its life cycle, which is connected with research, development, the production and testing of models, and their turning

over for series production. But here is the not very optimistic chronology of this process. In 1971-1972 stands were produced. In 1976 the experimental model was tested. Tests of prototypes were planned for 1984-1985. And they should be completed only by 1986. Thus, if these necessary stages pass successfully and the manufacturing plant is specified, the path from the idea to the machine will approach 2 decades!

Such a delay seems to be due to quite objective reasons--the lack of experimental capacities and the existence of a number of other operations which were performed at the same time. But the administrative influence of the ministry in this specific case should also, obviously, have found expression in the corresponding adjustment of the sectorial plan of research and development, which would have prevented such a time lag. Apparently, when formulating sectorial plans in such situations, including for necessary experiments, priority conditions of financing and material and technical supply should be established. This will make it possible to shorten the path, at least for fundamentally new equipment, to the approval of the technical assignments and its delivery to production.

The return of inventions, the technical and economic potential of which is significant, should be increased significantly. The specific indicator of the efficiency of inventing and efficiency work in the coal industry, for example, in 1982 came to 18 rubles per ruble of expenditures. This is a little more than fourfold greater than the average sectorial efficiency of research. But here is information for thought: of the total fund of inventions of the sector in 1982 only 28.5 percent were used directly in production.

The causes of such a low return of inventing work are complicated and ambiguous. Among them several, in our opinion, merit special attention: the shortage of experimental and design capacities, the lack of development of the organizational and economic mechanism which regulates the interrelations of the developing organizations and the production workers, the costs in the management of inventing. It is possible to illustrate what has been said by examples from the practical experience of the Kuznetsk Affiliate of the Scientific Research Institute of Open-Cut Mining, which was organized in late 1968. During the years of its existence (of course, it is necessary to subtract from this the time of the initial accumulation of inventing "capital") more than 100 inventions have been developed here. But the regular inventory of their fund, which was made not that long ago, showed that only 15 are being used, including 8 which are at the stage of series production, while the remainder are at various stages of development. And it has been possible to introduce only one invention--a device which is intended for scientific purposes. Consequently, a positive impact has been obtained here, there is nothing to report back with for any saving, although the economic potential of the developed inventions for the average amount of introduction approaches 200 million rubles.

There is no need to be surprised by the fact that due to such a drawn out stage of development a portion of the inventions became obsolete, while many were outside public attention as a consequence of the changed themes of the affiliate. And for the present there is no clarity even with respect to the themes which it is planned to use in the future. Practically every one of

them for its implementation requires a design analysis and can be embodied in metal only after this. The affiliate does not have either a design subdivision or its own experimental base. It is not that simple "to be inserted" in the plans of outside organizations.

If we speak about the experimental plants or workshops of other institutes, regardless of their workload the path there is prohibited--the intradepartmental and especially interdepartmental barriers here are precisely arranged. The attempt to produce something at repair plants of associations is also completely doomed to failure: at each of them from year to year the shortage of repair capacities is increasing. But even the introduction of inventions, which does not involve the necessity to produce models, encounters many difficulties. It is well-known that there are no experimental sections, which are free from the plan on production, at any of the enterprises of the sector. Any intrusion from outside, even with the best intentions, alters the established organization of the production process and threatens to upset the plan. This alone can to some degree explain, if not justify, the resistance of production workers. But with the increase of the scale of tests of prototypes of new equipment the lack of specialized organizations with the corresponding plans on labor, wnich could take such a matter upon themselves, is being felt more and more urgently. This is especially important when it is a question of equipment of a high level of complexity, which requires the corresponding skills of the installers and adjusters.

Not by chance was it envisaged in the coal industry starting in 1984 to create reserves of capacities for the preparation of the production and the assimilation of new types of equipment and materials. Indeed, without having ensured the necessary material, technical, organizational, and economic prerequisites for the development and production of models, their testing and subsequent introduction, it is hardly possible to count on successful results.

For many years now, for example, tests and the operational development of equipment of the automatic recording and monitoring of the operation of KRM-1 power shovels, which was developed by the Kuznetsk Affiliate of the Scientific Research Institute of Open-Cut Mining and the GUA and was produced by the Bykovo Experimental Plant of Automation Equipment, have been carried out. As a consequence of the dragged out cycle of development the element base of the equipment repeatedly became obsolete and it had to be designed anew with allowance made for the achievements of scientific and technical progress in instrument making (here its advance was more rapid). Meanwhile the use of this equipment, while not providing a too large economic impact, makes it possible to keep an objective account of the output of the basic mining machine in open-cut mining. This is very important: for the main value indicators of the open pits, on which the end results of management depend, are formed precisely here.

However, in this case the Bykovo Plant was also not at its best: the models produced by it needed large amounts of developmental work. Together with the costs in designing all this also created such a difficult situation. Here the fact that institutes of the Ministry of the Coal Industry are engaging in the follow-up development of the excavator, which is produced by the plant of the Ministry of Heavy and Transport Machine Building, while the plant of the

Ministry of Instrument Making, Automation Equipment, and Control Systems should produce such equipment, is also very significant. It is clear that such interdepartmental developments need coordination on part of the State Committee for Science and Technology within comprehensive goal programs.

Let us return to the question of extradepartmental appraisal. The change of the established procedure of the preliminary evaluation of the promise of themes at the stage of planning is an exacting and labor-consuming job, but nevertheless it is necessary to take this path. If we speak about its possible directions, the organization, which is similar to the one that is used by the Higher Certification Commission when appraising dissertation research, seems most practicable. The experience of the State Commission of Experts attached to the USSR State Planning Committee may also prove to be useful. Obviously, within the sector it is advisable to establish an expert committee, to which the most skilled scientists and specialists would belong. Variants are possible here. But it is important that the principle of the independence, objectivity, and sufficient competence of the expert commission would be observed. It seems that by this measure alone it would be possible to prevent the appearance in the thematic plans of weak works, insufficiently promising works, or works which simply repeat the results which were obtained for other conditions.

The analysis of domestic and world trends in the area of the organization of research and development points to the ever increasing penetration of the ideas of the goal program approach. In the practice of the coal industry, unfortunately, the orientation toward this approach did not go farther than the planning of themes and the distribution of only financial resources. The material, technical, and other supply of the sectorial plan of research has not yet undergone such modification at all.

Undoubtedly, such organizational innovations as the creation of a network of large production and scientific production associations, as well as temporary scientific production subdivisions (complexes) for the most important national economic problems would help to use better the scientific and technical potential of the sector. However, it must be admitted that the majority of measures outlined by the sectorial order on the acceleration of the pace of scientific and technical progress still retain traits of the traditional administrative and management supply of research and development. Meanwhile the peculiarities of the geography of the distribution of the scientific and technical organizations of the coal industry (mainly among the basins) are also creating, in our opinion, favorable prerequisites for productive research in the area of the material, technical, and organizational service of research and development.

The capacities of the experimental bases today obviously do not conform to the needs, and at the same time the peculiarities of experimental production are responsible for the very low utilization ratio of the equipment available there. Moreover, at small plants, in essence, experimental workshops, at times it is inadvisable to develop all machine building process stages. This circumstance in turn is responsible for the significant amounts of cooperation.

The establishment of centralized experimental bases according to the basin principle, it seems, conforms more to the spirit of the goal program management of research and development. At present, for example, in the Kuzbass, where more than 10 institutes of the sector or their basin subdivisions are concentrated, only a portion of them have experimental plants, which it would be more correct to call low-capacity workshops. Those of the institutes, which lack altogether a production base, are forced through the mediation of the USSR Ministry of the Coal Industry to place their orders at plants of other organizations. This process usually occurs painfully and involves economic costs. Thus, the pilot experimental plant of the Ukrainian SSR State Scientific Research and Planning Institute of the Coal, Ore, Petroleum, and Gas Industries, which is located in Kiev, produced the MO-1 unit for the drying of blast holes, which was developed by the Kuznetsk Affiliate of the Scientific Research Institute of Open-Cut Mining in cooperation with the Kemerovo Coal Association. The explosion bulldozer, which was developed by the Institute of Mining imeni A.A. Skochinskiy jointly with the affiliate of the Scientific Research Institute of Open-Cut Coal Mining, should make a road from the Moscow area to the Kuzbass.

The formation of powerful centralized bases, which have all the machine building process stages and are furnished with stands and test equipment, is capable of eliminating many shortcomings of the existing organization. The national economic impact achieved in this case does not reduce, of course, only to the more complete and efficient utilization of equipment. Here the saving in construction and installation operations is also very significant--a circumstance which it is impossible not to take into account, especially for regions with a labor shortage. Better utilization ratios of production areas, raw materials, and materials are ensured under the conditions of centralized experimental production. Here, finally, favorable prerequisites are created for the more efficient coordination of experimental operations in accordance with the sectorial plan. Strictly speaking, in the future centers of the goal program organization of research and development could arise on the basis of such structural units. But the need for them is being felt already today. Apparently, it would be possible to subordinate such a basin formation to the technical administration or to develop it under the aegis of a specialized all-union industrial association.

A no less important reserve of the more efficient use of the scientific and technical potential of the sector is the improvement of information service, about which I have already had occasion to write in the pages of the journal. (Footnote 1) (See SOTSIALISTICHESKIY TRUD, No 2, 1985, p 38) Under the conditions of the goal program orientation of the sectorial plan of research and development, as, incidentally, also in case of traditional planning, the factor of sufficient information is a very essential tool of the management of the end results of the research process. And this circumstance urgently requires the reinterpretation of a number of established stereotypes.

It is expedient to orient the main information institute of the sector entirely toward the information supply of the sectorial plan of research and development. Here along with editing and publishing work purely information work should also be performed, moreover, it should not be confined only to library bibliographic procedures. Apparently, it is necessary first of all to

practice the compiling of surveys (thematic and others). In other words, the corresponding subdivisions of the sectorial information institute or, in terms of the goal program approach, the center of the information service of research and development, should act as coperformers of this plan (along with the experimental plants). Such a structural reorganization of the center of information service of research and development, in case of which it would be possible to form mobile subdivisions according to the problem principle, seems wise and necessary. Such a center should have an institute of nonstaff reviewers from among the most skilled scientists and specialists of the sector (following the example of the two largest academic institutes--the All-Union Institute of Scientific and Technical Information and the Institute of Scientific Information on the Social Sciences).

It is also important to put to use all the reserves of the acceleration of scientific and technical progress, because for their implementation no capital investments are required.

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ORGANIZATIONAL, ECONOMIC PROBLEMS OF MANAGING S&T PROGRESS

Moscow SOTSIALISTICHESKIY TRUD in Russian No 11, Nov 85 pp 35-44

[Article by doctor of economic sciences V. Pokrovskiy under the rubric "Science for Production": "Organizational and Economic Problems of the Management of Scientific and Technical Progress"; capitalized passages published in boldface]

[Text] Now, when the country is heading toward the 27th CPSU Congress, when its program documents are being prepared, it is important to examine thoroughly in what way it is possible to achieve the acceleration of scientific and technical progress, what in this connection it is necessary to reorganize in the system of economic management. There is an entire set of organizational and economic problems here. Several of them are examined below.

Planning is the heart of management. This is well-known. It is also well-known that the realisticness of long-range plans as a whole and in the end the degree of validity of the anticipated economic and social results of the functioning of social production depend on the proper organization of the planning of scientific and technical development. But in order to understand more specifically what problems are now arising here, it is necessary first of all to have a clear idea of the shortcomings of this process. There are two major shortcomings: the poor orientation of the plans toward the future, toward the solution of the problem of increasing sharply the efficiency of social production; the lack of regulation of the interaction of current plans and the plans on new equipment.

It would seem that all the conditions for surmounting these shortcomings exist. A sufficiently developed network of organizations, which make scientific, technical, and social forecasts, moreover, in the form of different versions of them, has formed. The comprehensive program of scientific and technical progress for 20 years in advance has been formulated and updated already several times in advance (2 years before the start of the five-year plan). The basic directions of USSR economic and social development for 10 years (with a breakdown by five-year plans), on the basis of which the control figures are specified, are being formulated regularly. With respect to the basic indicators and economic standards they are reported to ministries and departments of the USSR and the councils of ministers of the union

republics. Finally, the drafts of the five-year plans of sectors, associations, and enterprises are prepared on the basis of these figures. Moreover, tens of programs (including scientific and technical programs) of different levels and for different purposes are being formulated.

The system of planning, thus, seems quite well-balanced and complete. It lacks, in our opinion, a reliable mechanism of the assurance of mobile structural changes of the national economic proportions. But under the conditions of sharply accelerating scientific and technical progress this is vitally necessary. Experience in solving such problems exists: the rapid development of atomic energy and the production of industrial diamonds. But these individual examples have not yet become the rule. It is a question here, of course, not of any scientific and technical innovation and not of any measure. At present more than 800,000 minor measures, each of which on the average yields an impact of less than 6,000 rubles and frees in all less than 1 person, are introduced annually. It is a question not of them, but of the scientific and technical innovations, which can have a revolutionizing influence on social production as a whole, can make changes in the structure of the national economy, and can increase its efficiency sharply.

However, up to now an effective mechanism of the identification, analysis, and selection of the most important scientific and technical innovations has been lacking at the national economic level. Moreover, the economic and social problems, which scientific and technical progress makes it possible to solve, continue to be regarded as some incidental result which emerges by itself. For the present the priority of the socioeconomic goals of scientific and technical progress in practice is being underestimated. Frequently, especially in case of long-range planning, the replacement of economic and social goals with purely technical goals: to develop some model, to obtain some material, and so forth, occurs. And in the evaluation of series-produced products the "technical" bias for the present is pronounced.

The evaluation of the quality of industrial products remained for too long in essence a departmental tool of the sectors which produced these products. Cases of the insufficiently objective certification of products, unfortunately, are also occurring now. The certification commissions frequently "are carried away" by the engineering analysis of the quality of the product and do not properly take into account the needs of those who use it. Here it turns out that a high technical level of the item is formally registered, but in case of its use in production the efficiency of the product turns out to be with a minus sign. For THE FUTURE IT IS IMPORTANT TO SELECT SUCH SCIENTIFIC AND TECHNICAL ACHIEVEMENTS, WHICH CAN AND SHOULD INCREASE THE EFFICIENCY OF THE FUNCTIONING OF MANY SECTORS OF THE NATIONAL ECONOMY AND THE ECONOMIC SYSTEM AS A WHOLE. Moreover, their priority development with the supply of the necessary resources should be envisaged. In case of the planning of the development and use of important scientific and technical innovations it is necessary to agree consciously and boldly to economic maneuvering, having restricted if necessary what is old and having concentrated financial assets, manpower, materials, and equipment in the new field.

In practice it is possible to solve such a problem only when the necessary resources have been incorporated in the plan or reserves of the scientific and technical potential, capital investments, and production capacities are available. It would be naive to presume that reserves will be created by themselves. Therefore, it is necessary to form them in a planned manner. Incidentally, in speaking about reserves, it should not be thought that, for example, the capital investments or capacities, which have been included in them, will "lie about," so to speak, as dead capital. They can be used temporarily on the condition that if necessary it would be easy to reorient them in the new direction. During the 12th Five-Year Plan, for example, such a shift has to be made in favor of advanced technology and machine building, which ensures their real embodiment in machine tools, equipment, and measuring instruments.

Of course, the introduction of something new requires significantly greater mobility of planning organs of all levels. One must not fall into making the mistake, which was quite typical in the past (and at times at present as well), when the organs responsible for long-range planning looked calmly at such a situation which is forming, for example, with industrial robots. Practically all sectors, which also use them, are designing and developing them. This is a simple, but also least effective method. The result: a large number of models for the performance of similar operations, poor standardization, and, in the end, the low quality and expensiveness of each unit of manipulators. The situation essentially repeats the one which was observed in case of the development of computer technology. The users at first each developed machines for themselves, but then had to take urgent steps on the development of a uniform series of computers. Such a route proves to be very long, and the most important thing is that time, which in no way can be made up, is lost.

It seems that, while relying on the potentials of the socialist system and the best traditions of the organization of scientific and technical work in the latest fields, it is important and necessary to exert without delay a powerful centralized planning influence on the process of robotization and to avoid ineffective expenditures of time and assets.

As to the assurance of the better coordination of the processes of current planning and the planning of scientific and technical development, here it is necessary to fully implement in practice the idea of Comrade M.S. Gorbachev concerning the fact that the plan of science and technology should become the load-bearing structure of the entire plan. For this AT ALL LEVELS OF PLANNING IT WOULD BE ADVISABLE TO CHANGE OVER TO THE LEADING DRAFTING OF THE PLANS OF SCIENTIFIC AND TECHNICAL PROGRESS, AND ON THEIR BASIS TO FORMULATE THE OTHER SECTIONS OF THE PLAN. Such a precedent already exists. In accordance with the conditions of the economic experiment in the Estonian SSR Ministry of Light Industry the section of the plan "Science and Technology" (the assimilation of new types of products, the introduction of advanced technology, the mechanization and automation of production processes) should be drawn up 6 months before the consideration of the other sections of the plan of the sector. Thereby the role of the plans of the development of science and technology in the overall system of planning is increased; they are turned into the heart for the drafting of all other sections of the plans

of economic and social development. Apparently, this practice should be expanded, regarding it as the first stage of the changeover to the planning of scientific, technical, and socioeconomic development in a unified complex.

THE ORGANIZATION OF THE PLANNING OF NEW EQUIPMENT THROUGHOUT ITS ENTIRE LIFE CYCLE should become the second stage (the implementation of which it is nevertheless possible to begin at once). Then not only the development of scientific and technical innovations, but also the stages of their series and mass production, as well as application (use) at the consumer's will be included fundamentally in the plan. Attempts of this sort have been made, for example, at the Kriogenmash Scientific Production Association. However, there they were faced with considerable difficulties due to the more subdivided periods of the planning of financial assets, material and technical resources, and so forth.

Let us recall that at present the planning of the stages of the life cycle of equipment is dispersed among various departments, while within the sector it is also dispersed among different subdivisions of the ministries. Therefore, the task of organizing planning over the entire life cycle of equipment in connection with the socioeconomic results of its use is arising. For it is impossible without consideration for economic criteria to form standard periods of the updating of products! And it is not by chance that the decision on their introduction was made several years ago. However, so far they are not being used. Under the conditions of the substantial extension of cost accounting methods--and such a trend is clearly visible in the national economy--it is necessary to reorient the plan indicators to a greater and greater extent toward the end economic results of the use of new equipment or the implementation of specific advanced organizational measures. Such indicators should be clearly recorded in the standard procedural materials and instructions.

In practice the approach to the planning of the entire life cycle of equipment can be carried out in two directions. For relatively minor technical innovations confidence in its systematic supply with financial resources will be created with the changeover of a larger and larger number of enterprises and organizations to complete cost accounting (and such a process has already begun), as well as with the development of wholesale trade in means of production. With respect to the most important scientific and technical innovations it is advisable for the state to take upon itself the guarantees of the supply of all operations with resources over the entire life cycle, by concluding long-term contracts with the corresponding organizations and enterprises.

Such an organization of planning, incidentally, will help to solve another important problem of the organizational level. It is well-known that, in spite of all efforts, so far it has not been possible to shorten substantially the time of the development and introduction of new equipment. But this, of course, is of decisive importance for the fate of the intensification of production. For the present many by no means complex types of equipment take an extremely long time to be developed, and then wait even longer for introduction. Thus, the Tselinogradselmash Production Association needed 3 years for the development of the design of a wide-cut cultivator, and

another 7 years for its delivery to production. As a result they produced an obsolete machine.

As a whole for the national economy the average duration of the completion and introduction of developments on new equipment has not decreased for many years. On the average 4.5 years are spent on the performance of fundamental (basic) research, while the duration of each subsequent stage of the development of new equipment (applied research--development--introduction) usually comes to approximately 3 years. It is necessary to add to this another 2-3 months each for the interruptions in the cycle. In other words, we have enormous reserves for accelerating the development and introduction of new equipment.

It is necessary to manage the development of equipment, its production, dissemination, and removal from production as a unified complex. Therefore, the most important organizational factor, which makes it possible to accelerate scientific and technical progress, is the strengthening of the contacts of science with production, namely the fundamental uniting of science, technology, and production and the transition to a new stage of their complete integration.

The uniting during the development of new equipment of all the units of the "research--development--introduction (assimilation)--production--use" cycle should become the main principle of the organization of the management of scientific and technical progress under the conditions of the scientific and technical revolution. Scientific production associations, of which about 250 have now been established, are now gaining more and more extensive recognition. They make it possible to shorten the "science--production" cycle to one-half to two-thirds.

The efficiency of the activity of scientific production associations could, in our opinion, be significantly greater, if several organizational and economic problems, which concern the common interest of all the collectives belonging to them in the end results of their cooperation, were solved. After all, collectives, the members of which differ occupationally and for the present frequently pursue different goals, belong to these associations. These are researchers and designers, process engineers and planners, builders of buildings and installers of equipment, workers and engineering and technical personnel of production proper. The plan should unite their efforts. However, so far individual plans and balances by types of activity continue to be drawn up within scientific production associations. An attempt was made to solve the problem of common interest by the formation of unified economic stimulation funds. Such "unified" funds are being created, but the directions of their use are strictly "assigned" once again with reference to the professional groups of personnel. Reporting has also remained as before. It would seem that all these are formalities, but in practice they are turning into many difficulties in the organization of the interrelations of the subdivisions of scientific production associations and are decreasing their overall efficiency.

Thus far this type of associations has also experienced difficulties in the fulfillment of its tasks due to the fact that in the adopted statute the

emphasis in its functions was shifted substantially in the direction of current production. As a result the process of the development of new equipment at scientific production associations was under the strong pressure, for example, of the indicator of labor productivity, which is planned for the association as an ordinary enterprise which manufactures series-produced products. When in 1983 it was decided to change a number of scientific production associations over as an experiment to planning in accordance with the sector "Science and Scientific Service," here the scientific production associations were again faced with the resistance of sectorial planning organs to changing the base of planning and in general to conducting the experiment.

A FAST PACE OF SCIENTIFIC AND TECHNICAL PROGRESS CAN NOW BE ENSURED ONLY UNDER THE CONDITIONS OF THE SIGNIFICANTLY GREATER MOBILITY OF ORGANIZATIONAL STRUCTURES. Intersectorial and sectorial scientific and technical centers, introducing and engineering organizations, consultation centers, scientific research complexes at production associations, temporary scientific and technical collectives, and so forth have appeared in practice. When establishing the status of these new forms, one has occasion to be faced with approximately the same problems as are observed in the case with scientific production associations. It is necessary to solve them, of course, in the spirit of the times, by striving for the creation of the most favorable planning, organizational, and economic conditions for the accomplishment of the ultimate goals of each type of such organizations. It is important to surmount more rapidly, so to speak, the "functional" departmental barriers.

But there are also others--"sectorial" departmental barriers. They appear especially clearly when organizing work in the area of the specialization of production. It is well-known that the sharp increase of the science intensiveness of a new product requires more and more urgently that the scale of the production of such a product be increased. At the same time, in spite of the enormous advantages which are afforded by the socialist mode of production, the sales volumes of many items and products frequently prove to be comparatively small due to their poor unification and standardization. The range of items being produced is being expanded unjustifiably. Each sector, and frequently each enterprise (organization), in many cases considers it possible to act according to the principle "it may be a bit worse, but it is our own." For example, the tractors of the Minsk and Lipetsk plants are very similar in performance, only 2.7 percent of the parts are standardized. In just the production of blanks, parts, and assemblies, tools and accessories of general machine building use the national economic losses due to the low level of specialization come to 2 billion rubles.

It seems to us that in the very near future IT IS NECESSARY TO IMPLEMENT PERSISTENTLY THE PRINCIPLE OF THE STANDARDIZATION OF TECHNOLOGIES, TO EXTEND THE SECTORIAL AND INTERSECTORIAL STANDARDIZATION OF MACHINES, assemblies, and parts, and for items being newly assimilated to increase the indicators of standardization by several fold. Specialists have calculated, for example, that it is possible to reduce to one-twentieth the number of type sizes of gears. And if their production is concentrated at modern specialized plants, it is possible to reduce the production cost to one-fourth to one-third.

FOR THE INCREASE OF THE TECHNICAL LEVEL OF ITEMS IT IS ALSO NECESSARY TO USE MUCH MORE ACTIVELY THE SYSTEM OF STANDARDS. The standard in our country, as is known, is a law. However, the specific forms of responsibility in case of its violation (including economic sanctions) are so vague, that the violator in fact can always evade it. The task of making this responsibility real is very, very urgent. Its accomplishment will create an additional powerful stimulus for the introduction of the latest equipment and technology.

The problem of improving the management of scientific and technical progress is also closely connected with the organization of capital construction. At present about two-thirds of the measures on new equipment are being implemented namely through new construction. The shortcomings in this area have become chronic. These are the dispersal of investments among many projects, the lengthy period of the construction of new projects, and the poor attention to the renovation and retooling of enterprises.

In order to outline possible means of eliminating these shortcomings, it is necessary to understand the cause of the formed situation. The shortage of capital investments is frequently named as such. Indeed, from five-year plan to five-year plan the rate of their increase has been decreasing: whereas during the 7th Five-Year Plan with respect to the preceding five-year plan they increased by 44.9 percent, during the 8th Five-Year Plan--by 42.9 percent, during the 9th Five-Year Plan--by 41.7 percent, and during the 10th Five-Year Plan--by 22.7 percent, during the 11th Five-Year Plan an increase of only 10.4 percent was planned. But the analysis shows that during the current five-year plan capital investments are increasing more rapidly than was outlined by the plan, while the assignments on the placement of production capacities into operation are being substantially underfulfilled. This is clear evidence not of the shortage of investments, but of their poor use.

In our opinion, a set of measures should be implemented for the complete and timely assimilation of capital investments.

First, in a planned manner (with allowance made for the specific nature of sectors) TO ESTABLISH THAT A QUITE SPECIFIC MAXIMUM NUMBER OF CONSTRUCTION PROJECTS CAN BE COMMENCED FOR A SPECIFIC AMOUNT OF CAPITAL INVESTMENTS. And if the upper limit in the number of construction projects has been reached in the sector, each new one can be started only when one of the old ones has been completed.

Second, to shorten substantially the construction period. The question of the construction period is especially important because in case of the construction of many (especially large) projects there are frequent instances when the new technical approaches, which were incorporated when drawing up the plans, by the time of the placement of the projects into operation are already becoming obsolete. In this connection it seems advisable TO BROADEN THE POWERS OF MINISTRIES AND DEPARTMENTS, HAVING GRANTED THEM THE RIGHT IF NECESSARY DURING THE IMPLEMENTATION OF THE PLANS OF NEW CONSTRUCTION TO MAKE IN THEM CHANGES FOR THE INCREASE OF THE TECHNICAL AND ECONOMIC LEVEL OF PRODUCTS AND THE TECHNOLOGICAL PROCESSES. Incidentally, experience in the designing of construction projects to fit flexible technological processes

(which are still just being formed) exists in our country, and it should be used more extensively.

And finally, third, it is important to aim consistently for the retooling of production, because new construction costs more and requires significant material and technical resources and additional manpower, which there is nowhere to get in many regions. Moreover, it is impossible not to take into account that annually only less than 1 percent new enterprises are added to the tens of thousands of operating enterprises. Hence, namely operating enterprises had and will have a decisive influence on the efficiency of social production as a whole.

In practice ALREADY FOR THE 12TH FIVE-YEAR PLAN one should ESTABLISH THE SPECIFIC ENTERPRISES, WHICH REQUIRE PRIORITY RETOOLING, AND CONCENTRATE FORCES AND ASSETS AT THEM. They should have detailed plans of their implementation and carry it out not in the old way, but with the use of advanced methods of the organization of work on the renovation and retooling of production.

In order to improve the management of scientific and technical progress, under present conditions it is fundamentally important to increase the responsibility of the supplier for new equipment. It is well-known how great the losses from the insufficient delivery of even seemingly insignificant components and materials can be. Their lack at times leads to the freezing of assets, which exceed the volume of delivery by tens and even hundreds of fold. And although the volumes of so-called deliveries of complete sets are increasing in the country, still the problem remains. To a significant degree this is explained by the fact that the legal interrelations "supplier--recipient" have remained the old ones, while the sanctions for the nonfulfillment of contracts on time are essentially symbolic. Thei. amount depends only on the amount of the real shortage of delivery, but does not take into account its consequences.

It is possible, of course, to proceed in the direction of increasing the amount of the sanctions and to take into account the overall harm. But in such a case it is necessary to seek a more weighed solution, for in individual cases the amount of such sanctions can exceed not only the amount, for example, of the stimulation funds of the violating enterprise, but also the entire profit derived by it, and at times also the total volume of its production.

Economic stimulation holds a special place in the set of measures which are aimed at the improvement of the management of scientific and technical progress. It is appropriate to recall the widely known thesis of F. Engels that "the economic relations of each given society are manifested first of all as /interests/ [in italics]." (Footnote 1) (K. Marx and F. Engels, "Soch." [Works], 2d edition, Vol 18, p 271) The "interests" in the sphere of the development of science and technology under the conditions of the so-called shortage of personnel frequently appears in the fulfillment of a short-term theme or job and the attraction of some more workers. The material incentive is replaced here by material allowances, release from responsibility, and the unjustified increase of the wage funds. Therefore, at present the key problem of improving the management of scientific and technical progress is to

stimulate the human factor, first of all, of course, wherever new equipment is being directly developed and introduced.

In this respect the well-known Leningrad experiment, which helped to answer the question: how is one to increase the responsibility and material interests of the workers of design and technological services in increasing the technical level and quality of developments and in performing a larger amount of work with a smaller number of personnel, clarified much. In all the subdivisions, which since 1983 joined in the experiment, the creative return has increased, in the work of specialists the spirit of competitiveness has appeared, and executive discipline has been tightened up noticeably. The number of personnel was reduced during the 1st year by approximately 8 percent.

At the associations they used standards for design, technological, and other operations and established criteria (the degree of novelty of the designs being developed, the complexity and labor intensiveness of the jobs being performed) for the evaluation of the personal labor of each performer. These indicators are the main ones when determining the amount of the bonuses, which are paid only to those specialists who fulfill with a high quality and in good time the assignments established for them and increased the technical level of research and development.

Although the amounts of the salary increments of efficiently working specialists in accordance with the terms of the experiment (for the first time in our practice) were not limited, the managers of the subdivisions spent very economically the assets concentrated in their hands (which were formed by means of the saving of the wage fund). Here the differentiation of the increments subject to the contribution of the worker was very significant (from 10 to 190 rubles).

Since the planned amounts and labor intensiveness of design and technological operations at different enterprises changed at different rates, the need arose for the conversion of the workers of design and technological services to the standardized method of the planning of the number and the wage fund, within which the experiment on improving the remuneration of the labor of designers and process engineers was also subsequently developed. Very soon it also came to light that a number of circumstances, which are typical as a whole for the organization of work in the scientific and technical sphere: the unreliability of supply, frequent amendments to the approved assignments, and the lengthy process of acquiring the necessary equipment, opposed the conducting of the experiment.

What conclusions suggest themselves following the analysis of its first results? The Leningrad experiment for all its importance and attractiveness, in our opinion, shows that scientific and technical progress is being stimulated only indirectly--through influence on the efficiency of the labor of designers and process engineers. This, of course, is important. But at times quickly drawn up design and technological documents then lie about for a long time, they frequently have to be modified. Much capital is spent, but the return "is eaten up" at the subsequent stages. In short, the measures

envisaged in accordance with the conditions of the experiment are still poorly stimulating the increase of national economic efficiency.

THE INCENTIVE SYSTEM IN THE SPHERE OF SCIENCE AND TECHNOLOGY should be, so it seems, connected with three groups of factors. First, the payment of bonuses is called upon to stimulate the fulfillment and exceeding of the planned assignments, the decrease of the number of workers, and a high quality of labor, that is, the current results. Second, it is necessary to stimulate the achievement of a high technical and economic level of developments as a whole, which can be evaluated only after their completion (in accordance with the results of acceptance). Finally, the use of completed developments should be stimulated depending on the mass nature and the achieved economic impact, moreover, major developments merit, in our opinion, more substantial stimulation and without any limitations. And it is important to make the very organization of the payment of bonuses dependent on the improvement of the end national economic results.

Objections are usually raised to giving out bonuses only after the completion of the work. They say that many workers by the time of the payment of the bonuses will have already left the organization. Is this that bad? We believe that it is not: the responsibility for the end result will increase, there will be no elimination of personal responsibility, the turnover will decrease. As it seems to us, it is advisable to give incentives for major scientific and technical achievements separately to the organization and separately to the immediate developers.

Under the conditions, when the requirements of the more dynamic development of science dictate the need to create more flexible structures, it is apparently worth using special methods of the rotation of scientists. This will both yield an economic gain and to a certain extent protect against stagnation in work. In our opinion, the changeover to the system of the hiring (initially, perhaps, of individual categories) of specialists for the period of the fulfillment of specific assignments of the plan of research developments (with the establishment for them of a somewhat increased level of the remuneration of labor, so to speak, for uncertainty and risk) would completely satisfy the conditions of intensification. After the expiration of this period the labor relations between the administration of the scientific institution and the scientists should be considered dissolved. Such a form of hiring for work is not at variance with labor legislation (Article 17 of the RSFSR Code of Labor Laws).

The regrettably well-known "leveling" and "dispersing" should also be actively eliminated in science. Here, too, the wage should be determined first of all by the personal contribution to the common cause and by the effectiveness of labor. Any worker should have the right, as, for example, a writer or actor, to earn as much as he is capable of, and not as much as is "fixed" for him on the average. It is impossible to earn too much; what a person has EARNED is by right due to him.

No fewer problems also arise when managing the process of stimulating the labor factor in the sphere of production, which should become more receptive to scientific and technical progress. The main thing is to place the labor

collectives of production associations and enterprises under such conditions so that they simply could not do without scientific and technical progress. It is a question today of strengthening internal stimuli and taking into account the interests and needs of the enterprises themselves. Scientific and technical progress will not undergo acceleration, if the activity of the main unit of social production--production associations and enterprises--is not reoriented. SIGNIFICANT ADVANTAGES SHOULD BE GUARANTEED TO THE LABOR COLLECTIVES WHICH ARE ACHIEVING GAINS IN THE ACCELERATION OF SCIENTIFIC AND TECHNICAL PROGRESS. For the present it is unprofitable for enterprises to increase sharply the technical level of products, it is better to gradually make production more efficient.

The ratio of the assets, which are being channeled into the payment of bonuses for new equipment and for the basic, current results of the activity of enterprises, at present comes on the average to 1:14. Moreover, even the workers, who are directly responsible at the enterprise for the introduction of innovations, receive more than 80 percent of the bonuses for the fulfillment of completely different indicators.

The measures on changing over many sectors of the economy to the new conditions of management with allowance made for the results of the large-scale economic experiment are aimed at creating more favorable conditions for those production collectives which are successfully using scientific and technical achievements. The rights of production associations and enterprises have been broadened substantially, their responsibility for the end results of work has been increased; now assignments on the acceleration of scientific and technical progress, which envisage the development, assimilation, introduction, and increase of the use of new equipment and advanced technologies, are still being established for them in the five-year and annual plans. (Footnote 2) (See the decree of the CPSU Central Committee and the USSR Council of Ministers "On the Extensive Dissemination of New Methods of Management and the Increase of Their Influence on the Acceleration of Scientific and Technical Progress," PRAVDA, 4 August 1985)

With the changeover to the new conditions, however, not all of the problems of the interest of industrial enterprises in the rapid introduction of scientific and technical achievements are yet being solved. If we try to outline here the priority tasks, the main one, in our opinion, is THE ESTABLISHMENT OF THE DIRECT DEPENDENCE (through limits, standards, prices, and other levers) OF THE PLANNED RESOURCES, REVENUES, AND FUNDS ON THE TECHNICAL LEVEL, QUALITY, AND EFFICIENCY OF THE OUTPUT BEING PRODUCED, AS WELL AS OF THE LEVEL AND GROWTH RATE OF THE WAGE ON THE WORK ON THE ACCELERATION OF THE PACE OF THE INTRODUCTION OF THE ACHIEVEMENTS OF SCIENTIFIC AND TECHNICAL PROGRESS IN PRODUCTION. It would also be possible, in our opinion, to make several other more specific improvements. Thus, according to the prevailing procedure the maximum profitability of equipment being newly assimilated is limited, while that of equipment, which has been produced for long years and is already obsolete, is not. It is clear that the managers of enterprises and the labor collectives in such a case can choose. And in this choice the matter is far from always decided in favor of what is new and truly efficient for the national economy as a whole, and not for the individual enterprise.

In order to increase the interest of enterprises in the updating of the output being produced, it is advisable to use, as they began to do about 20 years ago, differentiated standards of the deductions from the profit for the incentive funds: lower ones for a product produced earlier and higher ones for a new product. It would also be possible to supplement these standards with the condition that the product should be not only new, but also highly efficient. For the present enterprises are working poorly on the assimilation of precisely such products.

Now the time is probably approaching, when it would be possible TO ELIMINATE THE REGULATION IN THE USE OF THE ASSETS, WHICH HAVE BEEN EARNED BY THE ENTERPRISE AND ARE INTENDED FOR ITS SCIENTIFIC AND TECHNICAL DEVELOPMENT, in particular, to unite at the level of the primary unit all the funds and assets being allocated for these purposes (the unified fund for the development of science and technology, the production development fund, budget allocations, deductions from the production cost, amortization deductions, bank loans, and so forth) into a single fund.

One should also agree more boldly to new forms of the organization of the stimulation of large-scale measures on the use of new equipment in production, for example, one should seek more effective means of stimulating the associations and plants, which have achieved the highest world level with respect to all the technical and economic indicators of production and the output being produced. At the same time one should INCREASE THE RESPONSIBILITY, INCLUDING THE PERSONAL RESPONSIBILITY, OF THE PURCHASERS OF NEW EQUIPMENT FOR ITS EFFICIENT USE, especially for the underutilization of the potentials incorporated in it. Thus, it would be possible to offset the losses due to the fact that the new equipment is being poorly used by the consumer (purchaser) by means of his economic stimulation funds.

The responsibility of ministries and departments for the large-scale introduction of the achievements of science and technology in practice also needs to be increased, since at present they bear almost no (and especially economic) responsibility for the efficiency of the decisions being made (especially long-range decisions).

It is necessary to direct attention to another problem. The point is that for industrial enterprises the assets being invested in the latest equipment are not "their own," "hard-earned" assets. The expenditures on the purchase of fixed production capital practically do not influence the financial results of production and the amounts of the material stimulation funds. Therefore, by no means economic criteria frequently predominate when deciding the question of whether or not to take a technical innovation. In many cases incorrectly understood considerations of prestige are in effect here, for such purchases as if attest to the "strength" of the management of the enterprise and department. The fact that the surplus profit is now being taken away from enterprises (with its transfer to poorly operating enterprises) is undermining the stimuli for intense labor and research and is orienting them toward work according to the principle "request more, give less." Apparently, it is worth LIMITING AS MUCH AS POSSIBLE THE SCALE OF REDISTRIBUTION PROCESSES, HAVING ATTACHED TO THE BUDGET A STRICTLY DEFINED LIST OF REVENUES AND EXPENDITURES. In precisely such a way it is possible to accomplish the task of actually

changing over production associations and enterprises to complete self-sufficiency, on the basis of the introduction of the standardized distribution of the accounting profit and the creation at them of the necessary financial assets and resources.

The organizational and economic problems, which arise in case of the improvement of the management of scientific and technical development, are of a diverse nature and pertain both to the economic mechanism as a whole and to its individual elements and the levels and units of the system of management. However, only in case of a comprehensive approach to their solution is it possible to ensure lasting gains in the area of scientific and technical progress and the entire socioeconomic development of the country.

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ORGANIZATION, PLANNING AND COORDINATION

MANAGEMENT OF ROBOTIZED TECHNOLOGICAL COMPLEXES

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[Article by candidate of economic sciences P. Susin, A. Osikov, and N. Zavarzin, the Center of the Scientific Organization of Labor of the Ministry of Heavy and Transport Machine Building: "The Management of the Robotized Complex"; capitalized passages published in boldface]

[Text] The need to change over to fundamentally new technologies and to equipment of the next generations was emphasized with all urgency at the April (1985) CPSU Central Committee Plenum and at the conference in the party Central Committee. Speaking at this conference, Comrade M.S. Gorbachev said that we should introduce new equipment which entails revolutionary changes in production. The most advanced organization of labor, which is based on the latest achievements of science and is capable of ensuring the maximum return from such equipment, should also, of course, correspond to it. It is a question, in particular, of modern robotized technological complexes (RTK) and of brigades of a new type, which attend them.

A number of technical and organizational problems arise when introducing such complexes, among them are: the preparation of the robotized technological complexes for start-up, the development of standards of the number of workers, who are employed in the operation, repair, maintenance, and adjustment of the robotized technological complexes, as well as of the engineering and technical personnel, who prepare technical specifications, programs, and so on. The Center of the Scientific Organization of Labor of the Ministry of Heavy and Transport Machine Building, having studied the structure and personnel and the questions of the organization of the attendance of the complexes which are operating in our and other sectors of industry, drew up "The Model Structure and Standards of the Number of Workers and Employees, Who Are Engaged in the Operation and Attendance of Robotized Sections." By means of this document it is possible to determine the standard number of all categories of people working at the complex, who are united into brigades, which ensures interchangability and the combining of occupations and makes it possible to perform the amount of work with fewer personnel. The production plan and the technical and economic plan with all the cost accounting indicators are issued to the brigades. Programmer-process engineers, electronic engineers, operators, adjusters, repairmen, and electricians for the repair of electrical

equipment are included among them. A machine operator for equipment repair can be included in such a collective, if his workload in the given robotized complex comes to 100 percent. A brigade leader from among the process engineers, programmers, or electronic engineers heads the brigade. All types of the repair service of the robotized technological complexes during the year and for the subsequent periods are attached to it.

The standards of the number of engineering and technical personnel and auxiliary workers, who attend complexes or robotized sections, presented the greatest difficulty, since sufficient statistical material, which would make it possible to establish component-by-component differentiated standards, has not yet been accumulated.

During the gathering of the source materials and the studies of robotized technological complexes at enterprises of the sector the organization of the labor and service of the workplaces in the robotized section was studied, the performance of the equipment installed there, the list of operations being performed, the list of the positions of employees and the occupations of workers, and the diagrams of the subordination of subdivisions and individual performers were examined. During the analysis the dependence of the labor intensiveness of the operations being performed on basic and secondary factors and the degree of their influence on the number of workers and employees were determined.

By means of the model structures it was possible to work out a system of the subordination of subdivisions (individual performers) and the precise breakdown of labor among the individual units, to differentiate their rights and duties, to increase the efficiency of activity and the reliability and completeness of the monitoring of the progress of production, and to ensure the continuous and high-quality maintenance of the robotized sections. THE MODEL STRUCTURES AND LISTS OF THE POSITIONS OF EMPLOYEES envisage the organization of bureaus (groups) in the corresponding subdivisions of enterprises.

A design and technological bureau (group) for the robotization of production processes is being set up in the division of the automation and mechanization of production processes. Within it there are the chief of the bureau, design engineers, design technicians, and process engineers of category I, II, and III. A group for the designing and programming of industrial robots and manipulators, to which programmer-process engineers and programmer-process technicians belong, is being formed in the division of the chief process engineer (chief welder, chief metallurgist) in the bureau of the introduction of NC machine tools (machines). A group, to which the equipment of the robotized section is attached and in which in addition to design engineers there are repair engineers and electronic engineers, is being formed in the division of the chief mechanic (power engineer) in the bureau of the repair and maintenance of NC machine tools. The position of performer for the introduction of programs in the robotized section belongs to the technological bureau of the shop.

WHEN CALCULATING THE STANDARD NUMBER of employees various norm-forming factors were taken into account. For example, for the design and technological bureau for the robotization of production processes this is the number of robotized technological complexes and their complexity, which is expressed in the total of units of repair difficulty of the serviced equipment of the robotized section. For the group for the designing and programming of industrial robots and manipulators the number of programs being developed for the robotized section and the number of robotized technological complexes are such a factor, while for the repair and maintenance group the total of units of repair difficulty of the serviced equipment and the number of robotized technological complexes are such a factor. The basic tasks, functions, rights, and responsibility of newly organized subdivisions are presented in the corresponding model statutes, while the duties and rights of the performers are presented in the job instructions.

In the standards of the number of basic workers the coefficient of the employment of the operator and the number of physical units of equipment in the robotized complex are used as the norm-forming factors. Such standards have been established for lathe operators, milling machine operators, turning and boring machine operators, boring lathe operators, drillers, founders of metal and alloys, founders at die-casting machines, painters, and electric welders at automatic machines. The standards of the number of workers who attend robotized technological complexes (see the table) contain data for the calculation of the number of repairmen, machine operators, electricians for the repair of electrical equipment, and adjusters of robotized technological complexes with respect to each type of production with allowance made for the characteristics of the equipment. The difficulty of repair of the equipment belonging to the complex (machine tools, presses, machines, and so on, robots and manipulators, all the auxiliary units which ensure its functioning) was made the basis of the calculation. When establishing the norms of time per unit of repair difficulty in case of the repair and the maintenance between repairs of the robotized technological complexes and in case of the adjustment of equipment by the adjusters, they took into account the amount of all types of maintenance of the basic equipment, robots, manipulators, and devices, as well as the list and amount of work on the adjustment of the robotized technological complexes.

When calculating the number of adjusters attending the robotized technological complexes the type of production, which characterizes the number of adjustments and readjustments performed by them during the shift, is taken into account. In connection with the fact that the type of equipment (lathes, milling machines, drilling machines, presses of different force, and so on) is one of the factors which determine the number of adjusters, in case of its establishment it is necessary to calculate separately the totals of the units of repair difficulty with respect to each type of equipment and with respect to its auxiliary devices. Then these values are added up and the number of adjusters of the robotized technological complexes is determined with allowance made for the correction factors for the type of production. Obviously, the system of standards should be revised with the further development of robotized sections and flexible systems.

An Example of the Determination of the Number of Adjusters in Robotized Machining Sections

Total of units of repair difficulty	NC Machine Tools								Automatic lathes with a machining diameter, mm			Lathes with a machining diameter of parts, mm		Semi-automatic lathes
	Lathes with a machining diameter, mm		Drilling machines with a drilling diameter, mm			Milling machines with face milling cutter		with plain milling cutter						
	to 400	over 400	to 12	over 12 to 25	over 25	to 125	over 125		to 10	over 10 to 20	over 20	to 400	over 400	
50	0.16	0.18	0.12	0.14	0.16	0.15	0.24	0.08	0.14	0.17	0.21	0.09	0.11	0.14
70	0.23	0.26	0.17	0.20	0.22	0.20	0.33	0.11	0.20	0.24	0.30	0.12	0.15	0.19
90	0.29	0.33	0.22	0.25	0.28	0.26	0.42	0.14	0.25	0.30	0.38	0.16	0.20	0.25
150	0.48	0.55	0.37	0.42	0.47	0.44	0.70	0.23	0.42	0.50	0.63	0.26	0.33	0.41
200	0.65	0.73	0.50	0.56	0.62	0.58	0.94	0.30	0.56	0.67	0.85	0.35	0.44	0.55
250	0.81	0.92	0.62	0.70	0.77	0.73	1.17	0.38	0.70	0.84	1.06	0.44	0.55	0.69
300	0.97	1.10	0.74	0.84	0.93	0.87	1.41	0.45	0.84	1.00	1.27	0.53	0.66	0.83
350	1.23	1.28	0.88	0.98	1.09	1.02	1.64	0.53	0.98	1.17	1.48	0.61	0.77	0.96
and so on														

I would like to note that, in our opinion, THE STANDARDIZATION OF INDUSTRIAL ROBOTS and the formulation of state standards for them ARE REQUIRED, which will make it possible to shorten their list, to decrease the diversity of the robots being designed, and to reduce the enormous expenditures of state assets on their designing and production. The large list of parts requires the development of a large number of storage units of all possible kinds and other auxiliary mechanisms and devices. For small plants, at which there are not sufficiently skilled services and a good tool shop, it is very difficult to produce such devices, consequently, it will also be difficult to introduce industrial robots. In our opinion, in the country there should be a main institute for the development of not only robots, but all the means of their technical equipment. It is necessary to achieve such a situation so that it would be possible to use general-purpose means of robotics and standardized devices with the minimum modification at all enterprises where there are technological operations that are similar in structure.

In order to assimilate quickly and use efficiently robotized systems, it is also necessary to improve significantly the technological preparation and operational planning of production. This will facilitate the development, editing, and keeping of a library of control programs, the designing and production of the necessary tools and accessories in case of their absence at the warehouse, as well as the process planning of the need of the robotized technological complexes for tools, and the calculation of the utilization of equipment. The drawing up of the schedule of the production of parts by section, the shift and daily assignments on the utilization and machining of parts, and the preparation of tools, accessories, and control programs will be simplified.

For the calculation of the number of personnel for the repair and the servicing between repairs of robotized technological complexes it is necessary to know the difficulty of repair of each unit of equipment or auxiliary device. However, today the planning institutes are not establishing this indicator and the enterprises are attempting to calculate it independently. This is giving rise to a disparity in the numerical values of the complexity of repair, as well as is leading to the establishment of a different number of maintenance personnel at identical complexes or in identical flexible machine systems. In our opinion, categories of repair difficulty should be calculated for all robots of domestic and foreign make and for auxiliary devices, as is being done for all metal-cutting equipment in the USSR by the Experimental Scientific Research Institute of Metal-Cutting Machine Tools.

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TRAINING AND EDUCATION

INSTRUCTION IN INFORMATION SCIENCE, COMPUTERS AT SCHOOLS

Riga SOVETSKAYA MOLODEZH in Russian 28 Aug 85 p 1

[Interview with Corresponding Member of the USSR Academy of Sciences Professor Leonid Presnukhin, rector of the Moscow Institute of Electronic Engineering, by journalist V. Dobin under the rubric "The School: Steps of Reform": "Information Science Enters the Classrooms"; date, place, and occasion not given; first two paragraphs are SOVETSKAYA MOLODEZH introduction]

[Text] Automated control systems, industrial robots, computers, robotic complexes.... Without them modern production is inconceivable. What should the training of future workers--today's students of vocational and technical schools, who tomorrow have to take upon themselves the control of this most complicated equipment--be like?

Journalist V. Dobin interviews Corresponding Member of the USSR Academy of Sciences Professor Leonid Presnukhin, rector of the Moscow Institute of Electronic Engineering.

[Question] Not that long ago the universal introduction of computer technology in production and the educational process was a matter of the relatively distant future, but today school children and students of vocational and technical schools are already studying the principles of information science and computer technology....

[Answer] Our country has a reliable material base for the production of microelectronic equipment and large-scale and super large-scale integrated circuits. The domestic electronics industry is capable of producing a practically unlimited quantity of components, on the basis of which computing and data processing complexes, which are most diverse in their possibilities and are being used in the sphere of scientific research, at a specific works, and in the educational process, can be developed. Moreover, I am speaking not about the future, but about what we have today.

[Question] That is, in discussing the prospects of the training of young workers, do you have in mind not the year 2000, but already 1985?

[Answer] Precisely. Automated enterprises are operating already now, they need workers who know new equipment perfectly. And programming is becoming just as necessary to man as the ability to read and write.

[Question] But programming is one of the most difficult sciences. Is the reliance on those boys and girls, who are studying at schools the principles of information science and computer technology, warranted?

[Answer] The experience of the work of the enterprises, at which flexible machine systems are already in operation, shows: precisely young people are better capable than others of servicing new equipment. Of course, while having good specialized and general educational training....

[Question] And without having many years of experience?

[Answer] Yes, the experience which at times paralyzes the initiative of experienced workers. Young people are included quite rapidly in modern production and work skillfully. Precisely for this reason it is splendid that the study of the principles of information science and computer technology has been included in the syllabus of vocational and technical schools and has become a special subject. It is important that the graduate of the school would not be afraid of it: it will not in the least complicate his work and, on the contrary, will facilitate both intellectual and physical operations.

[Question] But it is necessary to surmount the psychological barrier which arises every time that we are faced with something difficult, unknown, unusual....

[Answer] A barrier actually does exist. And all of us will have to accomplish an enormous psychological change. There is no other way out, if we want to keep in step with the times. Modern equipment requires of people a broad education and a profound intellect.

[Question] Is it turning out that today's vocational and technical schools should train no longer simply workers, but, so to speak, a new technical intelligentsia?

[Answer] To attend a machine tool today does not at all mean to turn knobs and to make measurements with sliding calipers. The automatic machine, the control system...are assuming these functions.

The intellectual part of the activity of the worker has become much more diverse, it is approaching engineering thought. For example, the fitter-adjuster of high current equipment should not only know how the equipment works, but also imagine the physical processes occurring in the equipment and study automatic equipment and computer technology.

But not only for this reason, I am convinced, can the worker not manage today without a knowledge of the principles of information science and computer technology. For this is still a general science subject, which makes it possible to broaden the outlook of children and to give them an idea of modern equipment in general. Therefore, vast work is also being performed now at

schools and at vocational and technical schools on the training of the instructor and on the supply of the process of instruction with computer technology.

On the basis of personal computers we are setting up at schools so-called computer classrooms. It is convenient for everyone--both the children and the educators--to work in such classrooms. Quite reliable computer hardware is in the hands of the students, while the teacher has a computer. By means of the communications system they have the opportunity to communicate. Here the educator can as if functionally enrich the workplace of the student, without at the same time complicating its equipment.

Moreover, our institute has developed a special programming language--fokal, it is implemented as a single chip of an integrated circuit, which has been made a part of the computer. This language facilitates the process of instructing students in computer technology. It is quite simple in the interaction of man with the computer. The program itself was made as short as possible, so that there would be nothing superfluous in it. As we say, the student can easily edit this program.

By knowing fokal, the children can then shift quite easily to more complex programming languages.

In general I believe that the development of information science in our country, as, incidentally, abroad as well, is having the result that the intellectual portion of the work would fall more and more to computer hardware and would require of man less and less specialized knowledge, that the communication of man with the computer would take place in a language, which is close to people and to which they have become accustomed. It must not be thought that with the complication of computers the control of such machines will also become complicated.

[Question] Since you have touched upon the question of the interaction of man with computer, allow me to ask a question from the field of psychology. Does it not seem to you that, in thinking about the intellect, we have forgotten that it is necessary to cultivate in future workers simple human qualities: discipline, honesty, diligence? Does modern technology teach all this or, while becoming more and more complicated and, so to speak, abstract, is it freeing man of such "anachronisms"?

[Answer] I am convinced: when the blacksmith shifts from the hammer and anvil to the forging press, and then to the automatic machine, not only the nature of his work, but also his self-consciousness change. His self-respect increases. A kind of culture of the interrelations of man and the computer is created. Precision equipment does not tolerate slipshodness, dishonesty, and thoughtlessness. It disciplines man and makes him better.

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AUTOMATION AND INFORMATION POLICY

COORDINATION OF INTERDEPARTMENTAL INFORMATION EXCHANGE

Kishinev SOVETSKAYA MOLDAVIYA in Russian 19 Oct 85 p 2

[Article by L. Kazakov, deputy chief of the Special Design Bureau of Precision Casting of the Tochlitmash Production Association (Tiraspol): "A Time of Active Operations"; first paragraph is SOVETSKAYA MOLDAVIYA introduction]

[Text] Technical ideas--this perennial food for human thought--are good, of course, only in fresh form. Stale, they lose taste and, thus, their quality. We will not touch upon all the factors which are checking the progress of valuable ideas. Let us dwell on just two, so it seems, very important things: the state of scientific and technical information and interdepartmental coordination.

Indeed, is it possible to do without an efficiently organized network of information supply? Something extremely necessary for the Tiraspol machine builders, for instance, was successfully solved at the Kishinev Tractor Plant or, say, at the Beltsy Electrical Equipment Plant. One would not knock at every door, asking the same question: "And what do you have?"

Consequently, an actively operating republic center of the exchange of information, which would systematize the information on the scientific and technical problems solved in the republic and would disseminate it among the enterprises and organizations in the form of systematic information, is very urgently needed. I foresee an immediate objection: such a center exists--the Moldavian Scientific Research Institute of Scientific and Technical Information. However, today it is solving these problems, unfortunately, not completely. Recently we addressed to the institute the request to provide us with the necessary material for the designing of printed circuit boards. The institute issued a film to us for temporary use. What is one to do with it further? The material contains 500 pages, we need it every day. We request to have copies made. They refuse, citing the large size.

I am far from thinking of analyzing the work which this recognized institute is performing. It is a question of the fact that the republic center, in which all scientific and technical information is being accumulated, at the present stage should in many ways reform the system of its work. This, in my opinion, is one of the important reserves of the increase of the creative return of scientific and engineering thought.

Now about another question, which also pertains to the problem of the more complete use of the potential of engineering and technical personnel. In the structure of the time for the development of new equipment the introduction of the first prototypes accounts for the lion's share. This is natural: they come to light long before the technological readiness of the enterprise. For example, a new item needs a base member. The works cannot obtain it by casting and does not have the equipment for welding and boring. It is possible to do all this at a neighboring enterprise, but there they do not want to deal with others' business. The problem is not being solved. There is another version. A new item needed in small quantities components which are not available. But neighbors have them. To get something through direct ties means to violate the law. No one agrees to this. And again there is a delay. There are more than enough such obstacles.

At the conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress the advisability of establishing special councils for the promotion of scientific and technical progress was discussed. It seems that such an organ will be capable of solving many of the problems which were discussed above. It, apparently, will be able to carry out the "aimed" information support of the operations being performed by enterprises, to promote the dissemination of advanced know-how, and to coordinate the work on the fulfillment of the comprehensive goal programs of scientific and technical progress of the region. The council could organize the mutual exchange of components, attachments, accessories, and tools, the leased exchange of measuring equipment, and so on.

We have various councils. The product of their activity in most cases corresponds to the name: they give advice. Here it is a question of another thing. The new organs should have real powers. It should be in keeping with the times, which require active operations.

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PATENTS AND INVENTIONS

IMPROVED MANAGEMENT OF INVENTION ACTIVITY URGED

Moscow SOTSIALISTICHESKIY TRUD in Russian No 11, Nov 85 pp 47-51

[Article by G. Frolov, expert of the State Committee for Inventions and Discoveries: "Scientific and Technical Progress--Labor--Invention"; capitalized passages published in boldface]

[Text] The further development of invention and efficiency promotion is one of the most important factors of the intensification of production, the increase of labor productivity, and the decrease of the product cost.

"While devoting priority attention to the consolidation of large scientific and technical organizations," it was noted at the June conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress, "at the same time it is necessary to actively support the work of inventors and efficiency experts, to find forms of the selection of the most significant technical proposals, and to ensure their quickest introduction." Here it should, obviously, be recalled that the greatest impact is obtained when at the same time as the introduction of new equipment and technology the organization, rate setting, and remuneration of labor are improved, when a systems approach is maintained in this matter. And, hence, friendly joint efforts are needed. The organizers of labor should actively participate in the selection of everything that facilitates labor and increases its productivity. In turn the services, which organize the work with inventors, must act in close contact with workers of the personnel department, process engineers, and designers and aim the creative search first of all at where the expenditures of manual labor are great and resources are being used inefficiently.

In connection with the fact that the exclusive right to inventions belongs to the state, it assumes all the expenses on their consideration and introduction. An entire system has been established for this. At the first stage the inventions, which are of interest for the national economy, are identified. This process presumes the conducting of experiments, the generalization and evaluation of their results, and the selection of information and other materials for the purpose of finding new technical approaches. It also envisages patent research, which would contribute to the high-quality drawing up of applications for inventions, their registration and protection.

Since the labor services in this case belong to the basic clients, they, in turn, should participate more actively in this work and use the patent information more extensively, the basic goal of which is to provide the developing enterprises and organizations promptly with information for the extensive study and use of the achievements of science and technology, eliminating thereby duplication when developing technical solutions. A patent appraisal, which determines the novelty, essential differences, and utility of technical solutions, is made for this. Obviously, here, too, the active participation of specialists in the scientific organization of labor would be only of benefit.

The process of introducing inventions in production is the crowning point of all inventing activity. Here their technological and design development and the corresponding calculations and the preparation of the technical and technological documents are carried out, the prototypes (test batch), the trial run, as well as the main (control) run are produced and tested, the most economical and optimum conditions of the use of inventions are determined, and the documents are copied for their use throughout the country.

Life shows that the more rapidly and extensively inventions are introduced in the national economy, the more significant the impact is. For example, the creative brigade of workers of the Taganrog Order of Lenin Krasnyy kotelshchik Plant jointly with specialists of the Institute of Electric Welding imeni Ye.O. Paton developed an automatic machine for the welding of pipes onto the drum in closed vessels on low-duty boilers. Prior to this such work was performed by hand. As a result of the use of the invention at the Taganrog Plant alone the labor intensiveness was reduced by 42,300 standard hours. Now the new automatic machine is becoming widespread at other plants.

And, on the contrary, owing to the fact that inventions are not used or are introduced on a limited scale or the implementation of their results is dragged out, the national economy not only does not obtain the benefit, which it could have obtained (the missed advantage), but also suffers direct losses, moreover, their amounts are very significant, they are formed from the expenditures on the drawing up of application materials, the making of a patent study and appraisal, the upkeep of information and patent services, and so on. Suffice it to say that according to the estimates of the All-Union Center of Patent Services (VTsPU) the state spends on the average 202 rubles just on the drawing up of a single application and about 1,000-1,500 rubles on the patent study, the examination of a single application by the expert commission costs 55-100 rubles, and so on.

Meanwhile according to statistical data about 75,000 inventions appear annually in the national economy, but slightly more than a fourth are used, the remainder become obsolete, without ever finding application, although many of them at one time were recognized as highly efficient. Now it is not difficult to calculate what losses society incurs from the development of inventions which are not implemented. For example, the new technology of the continuous teeming of steel, which was developed in our country, did not become widespread in the national economy. In the scale of its introduction we now hold far from the first place among the industrially developed countries. According to the preliminary estimates of specialists, for each

ton of finished rolled products it would be possible in accordance with the new technology to consume 200 kilograms less metal than in accordance with the traditional method. As a result for the country as a whole about 7 (1) billion rubles a year are being lost. It is possible to cite many examples of when inventions, which are capable of yielding a high economic impact, are implemented extremely slowly or on a very limited scale in practice, and this is arousing certain anxiety. What are the causes of such a situation? What must be done in order to open wide the way for major technical innovations, which are of great national economic importance?

Executives of the USSR State Committee for Inventions and Discoveries link the poor work in this area with the shortcomings in the planning of the assimilation of new equipment. Frequently inventions are introduced without coordination with specific tasks on the decrease of the expenditures of materials, the saving of fuel and energy resources, the increase of labor productivity, and others. Here, too, the active participation of labor specialists could also be of appreciable benefit.

Here the task is being posed to plan the implementation of inventions in combination, for which first of all it is necessary to surmount interdepartmental barriers. The national economy suffers most of all from departmental isolation, since major innovations most often are of an intersectorial nature and, in order to use them, a comprehensive approach is required. Obviously, it is difficult to surmount interdepartmental barriers without the revision of the existing organizational structure. The search for organizational forms, in the process of which, in particular, specialized introducing organizations like the Baku Novator Firm or the Estonian Effekt Firm, which is similar to it, were set up, has already been told about in the journal. However, these firms have not undergone extensive development, although initially they also showed rather good results. The causes of their "extinction" have been analyzed in the press. The main ones of them are the lack of a legal status, a weak material and technical base, and financial, personnel, and other problems. The basic cause, in our opinion, is the inadequate centralization in the management of these organizational forms.

The republic Transprogress Industrial Association for the extensive dissemination of pipeline and container pneumatic transportation, which was established in the RSFSR on the basis of special design bureaus, in our opinion, is an example of the solution of the problem on a higher organizational basis. The association carries out the scientific and design development of systems of pneumatic transportation and designs them, produces nonstandard equipment, carries out the erection and maintenance of facilities, and trains personnel. The necessary capacities and assets, which are making it possible to fill systematically the orders for the introduction of pneumatic transportation throughout the country, have been allocated for this. However, unfortunately, there are few such examples.

TEMPORARY COLLECTIVES should be recognized, perhaps, as the most acceptable organizational form which is capable of solving most successfully the problems of introducing inventions of an intersectorial nature. So that their activity would yield positive results, it is necessary first of all to have a reliable material and technical base. The possibility of organizing such

interdepartmental subdivisions for the solution of urgent problems of an intersectorial nature is envisaged by the decree of the CPSU Central Committee and the USSR Council of Ministers of 18 August 1983, "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy," and the decree of the USSR Council of Ministers of 23 January 1984, "On Measures on the Support of the Activity of Temporary Collectives of Scientists and Engineering and Technical Personnel, Which Are Called Upon to Solve Urgent Scientific and Technical Problems of an Intersectorial Nature." The USSR State Committee for Science and Technology in consultation with the USSR State Planning Committee, the USSR Academy of Sciences, the USSR State Committee for Labor and Social Problems, the USSR Ministry of Finance, and the USSR Ministry of Justice in February 1984 approved "The Statute on the Temporary Collective for the Performance of Work on the Solution of Long-Range Scientific and Technical Problems of an Intersectorial Nature, the Development and Assimilation in Production of New Equipment, Technology, and Materials." The legal status of temporary collectives, which are called upon in the shortest time to develop and assimilate in production fundamentally new models of equipment, technologies, and materials for intersectorial use (including inventions which are of great national economic importance), is specified by this document.

The distinctive peculiarity of such collectives lies in the fact that they are organized only for the period of the solution of some scientific and technical problem, while after this they can be disbanded without detriment to the members of this collective, since they retain all the rights and privileges at the place of their permanent job. The members of the temporary organization are not bound by the framework of departmental subordination, which ensures relative independence. The temporary collective is formed of specialists of different types, of which versatility in the solution of complex problems is a consequence. With the change of the nature of the operations being performed the composition of the subdivision can also change and, thus, the functional flexibility of this organizational form is achieved.

Factors of a subjective nature also influence the implementation of inventions, especially major ones. Some managers agree more willingly to introduce minor ones--there are fewer troubles with them, and the result, although most often negligible, appears immediately, moreover, neither great expenditures, time, nor assets are needed, there is less risk. The inclination to purchase ready-made equipment and technology, often expensive imported equipment and technology, instead of developing and introducing their own, is also being observed. In short, the reluctance to burden oneself with the solution of problems of increased difficulty is appearing. The users--labor collectives, labor organs--should also have their firm say here.

It is possible to a considerable extent to promote the successful solution of the problem, by enlisting the authors in the preparation for the use of inventions, so that they would help to draw up technical and technological documents, produce and test prototypes, and design a new organization of production and labor. In this way a saving of time and physical assets is achieved, since no one knows so thoroughly the peculiarities of the proposed technical and organizational innovations. This is very significant, if you take into account that from an idea presented on paper to its material

embodiment there is a quite difficult path which involves large financial and manpower expenditures.

However, in practice there are frequent instances when some managers, in underestimating the importance of the participation of the authors in introduction, do not release them from their basic job, although this is not always dictated by production necessity, and do not enlist them in the implementation of inventions. But the duty to provide the proper conditions for the creative activity of inventors and efficiency experts and to give them comprehensive assistance and support was assigned to executives of ministries, departments, enterprises, institutions, and organizations by the decree of the CPSU Central Committee and the USSR Council of Ministers of 20 August 1973, "On the Further Development of Invention in the Country, the Improvement of the Use in the National Economy of Discoveries, Inventions, and Efficiency Proposals, and the Increase of Their Role in the Acceleration of Scientific and Technical Progress." The need to enlist the authors more extensively in the preparation for the use of their proposals, by forming for these purposes in necessary cases laboratories and special groups at enterprises, organizations, and institutions, is emphasized in this document. The CPSU Central Committee and the USSR Council of Ministers called upon the Central Committees of the Communist Parties of the union republics and the kray, oblast, and city party committees to create an atmosphere of intolerance toward cases of red tape in the implementation of inventions and efficiency proposals.

Obviously, it is necessary to combat such cases with all means: on the one hand, to punish strictly the makers of red tape, for example, by introducing fines, moreover, one should fine not the enterprises, but specific officials, and, on the other hand, it is necessary to place in a preferential situation with respect to finances and materials and in the supply of the latest equipment the enterprises and organizations, at which the work with the introduction of inventions is proceeding well. For this it would be advisable to develop a system of incentives for those who take upon themselves the burden of implementing innovations which are of priority importance for the national economy. It would be possible to arouse the initiative of enterprises and organizations and to aim them at the assimilation of major inventions, by having made more rigid the demands on the growth rate of production and its efficiency in order to force them to introduce new solutions and as quickly as possible, since not much can be achieved on the old equipment. In other words, it is necessary to see to it that managers simply cannot do without inventions.

Against the background of everything that has been said the conclusion of the necessity to improve the legal regulation of inventing activity and especially of the norms, which are aimed at the rapid and extensive use of major inventions, suggests itself. It seems to us that a special ALL-UNION STANDARD DOCUMENT, which regulates thoroughly all questions connected with the introduction of inventions and reflects the procedure of preparation for use and the evaluation of their significance for the national economy, is necessary for this. Accordingly it is necessary to develop a set of penalties and incentives in order to stimulate the priority implementation of the most important innovations of an intersectorial nature, the procedure of drawing up

the plans of their implementation, the basic indicators of their fulfillment, and so on.

A certain discrepancy in invention law, in our opinion, should be eliminated. Its essence consists in the fact that the enterprises, which produce products with the use of an invention and do not obtain in so doing a saving, in the statistical returns show the saving which formed for the user, while the latter, in turn, while having a real saving, cannot reflect it in the returns. At present it is not always possible to determine the saving from the implementation of inventions which were developed on a fundamentally new basis, since this is achieved only when the indicators of new technical solutions and the equipment being replaced are compared or if there is a profit. If such a comparison is impossible and there is no profit, the amount of the reward is determined in accordance with the so-called real value of the invention. But if it has a fundamentally new basis, there is nothing to compare it with. Here it turns out that it is much more profitable to improve the available equipment than to develop fundamentally new equipment. Such is one of the reasons, due to which the economic indicators of the enterprise are decreasing, which does not stimulate the introduction of new technical solutions. Of course, it is necessary to change such a situation. It seems to us that in this case it is advisable to improve the system of determining the economic efficiency, not only by comparing the indicators of the equipment being replaced and the new equipment, but also by taking into account the probable losses which this innovation will help to prevent.

Further, the assimilation of major inventions is a difficult, complicated process, it requires the reorganization of production, moreover, at times the smoothness of work is upset. But in order all the same to introduce an invention painlessly, it would be possible in individual cases to adjust the production plan temporarily, and then to make up for lost time. Of course, before this it is necessary to weigh all the pros and cons, in order to be convinced of the advisability of such a step.

Since enterprises at times use inventions unwillingly, it would be possible by way of the broadening of their rights and economic independence to introduce the stimulation of the output of new products which are based on advanced innovations. The essence of the proposal is that enterprises could keep a certain portion of the profit from previously developed inventions, new equipment, and other measures for several years and spend it for their own needs.

A large role in the development of the creative initiative of workers has been assigned to LABOR COLLECTIVES. It has been established by the law that they should take steps on the acceleration of scientific and technical progress and the extensive introduction in production and other spheres of life of the achievements of science, new equipment, advanced technology, and the scientific organization of labor and management and should further mass technical creativity, invention, and efficiency promotion. The duty to protect the rights of production innovators, to give support to the scientific and the scientific and technical societies and organizations of inventors and efficiency experts, and to take steps of the moral stimulation and to make proposals on the giving of incentives to workers, who actively participate in

the development and introduction of new equipment and technology, is being assigned to labor collectives. It is important that labor collectives would completely fulfill these provisions of the law.

SOCIALIST COMPETITION, which today has acquired qualitatively new features, serves as a mighty lever which makes it possible to implement inventions more rapidly in practice. It gives inducement to strive for the best end national economic results, to increase the efficiency and quality of work, to accelerate scientific and technical progress, and to save in every possible way manpower, raw material, and energy resources. For example, competition for the achievement of the best indicators in inventing, efficiency, patent, and license work is held annually in the sectors of the national economy. Its basic goal is the development of the creative initiative of workers and the increase of the activeness of inventors and efficiency experts. Thus, as a result of the competitions, which were conducted by the Central Council of the All-Union Society of Inventors and Efficiency Experts jointly with the USSR Ministry of Agriculture and were aimed at the implementation of the Food Program, it was recommended to use 80 developments extensively and 80 percent of the submitted proposals are already being used in agricultural production.

The newspaper SOTSIALISTICHESKAYA INDUSTRIYA came forth with an important initiative. It proposed to implement in 1985 a measure under the motto "From the Invention to Introduction!" The basic goal of this action is to speed up the implementation of especially important technical innovations. The USSR State Committee for Science and Technology, the State Committee for Inventions and Discoveries, the Central Council of the All-Union Society of Inventors and Efficiency Experts, and the Exhibition of USSR National Economic Achievements are participating together with the newspaper in this matter. It would not be bad to implement such measures with respect to all the sectors of industry, as well as by the forces of other organs of the mass press. The All-Union Review on the Maximum Use of Inventions and Efficiency Proposals in the National Economy, which was announced by the Central Council of the All-Union Society of Inventors and Efficiency Experts and the State Committee for Inventions and Discoveries for 1984-1985, is contributing to the further mobilization of the efforts of collectives of inventors, which are aimed at the acceleration of scientific and technical progress in the national economy.

The movement under the motto "Manual Labor Onto the Shoulders of Machines," which originated at enterprises of Kiev and Zaporozhye, is spreading. The innovators of Moscow, Moscow Oblast, Latvia, Estonia, Armenia, and Rostov and Kemerovo Oblasts have assumed the obligation to provide a third of the above-planned increase of labor productivity by the use of new equipment, inventions, and efficiency proposals. In Moscow, for example, more than 400 enterprises supported this initiative. According to preliminary calculations, the implementation of such measures will make it possible to free a significant number of workers, who are engaged in manual and difficult physical labor, and thereby to decrease the labor intensiveness of the production of products by 3.5 million standard hours.

Let us return once again to the question which was posed at the beginning of this article: What is it necessary to do in order to speed up and expand the use of inventions in the national economy? First of all it is necessary to

reduce the gap between the number of submitted applications and issued certificates of authorship and developed and introduced inventions. It is possible to solve these problems successfully, having increased the demands on the quality of the applications being submitted, in order not to pursue their number, but to strive to develop important highly efficient inventions. Then the number of refusals to issue certificates of authorship and the number of inefficient technical innovations will decrease, which, in turn, will make it possible to devote more attention to important technical solutions. It is possible to achieve this, in our opinion, by strengthening the invention, patent, and licensing services with highly skilled specialists, for which it is necessary to establish the more precise legal status of such services and to interest their workers materially. A definite step in this direction has already been made--the model statute on patent subdivisions, on the basis of which sectorial statutes are being drawn up, recently appeared.

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PATON ON ACHIEVEMENTS, GOALS IN LIGHT OF NEW CPSU PROGRAM

Moscow PRAVDA in Russian 21 Nov 85 p 3

[Article by twice Hero of Socialist Labor Academician B. Paton, president of the Ukrainian SSR Academy of Sciences (Kiev): "The Union of Science and Labor. The Opinion of a Scientist"; first paragraph is PRAVDA introduction]

[Text] The draft of the new version of the third CPSU Program as the main theoretical and political precongress document is arousing the enormous interest of each Soviet individual. It is inspiring us to new labor accomplishments, while also arousing us to analyze more thoroughly our own work and the means of our own improvement.

I would like to direct particular attention to one of the main provisions of the draft: the revolutionary changes in the productive forces are leading to the increase in the activity of the broadest masses of workers and kolkhoz farmers of the proportion of mental labor. At the same time the creative contribution of the intelligentsia to physical production and other spheres of social life is increasing. All this, it is noted in the draft, is contributing to the gradual elimination of the substantial differences between physical and mental labor and to the convergence of all social groups.

In section V of the draft of the new version of the Program it is indicated that "the complicated, complex nature of modern problems requires the intensification of the integration of the social, natural, and technical sciences." The particular significance of all fields of knowledge in the development of the productive forces and the improvement of social relations is singled out by this. The development of fundamentally new types of equipment and technologies, the increase of labor productivity, the rapid and efficient development of natural resources, and the improvement of the environment are inconceivable without science.

While completely supporting and approving of this conception, as well as the entire draft of the Program, I would like to express a few views on the development of science. First, it seems, it makes sense to tell how on the scale of our republic Academy of Sciences the work on providing the optimum conditions for the rapid development of the urgent scientific directions, on which the rate of scientific and technical progress depends, is going.

Just as before, we will attach priority importance to basic research with the simultaneous increase of its technological orientation. On this basis the institutes of the academy are striving to increase the contribution to the implementation first of all of statewide and regional programs. During the current five-year plan they are participating in 109 union scientific and technical programs, as well as in comprehensive goal programs and in 24 programs on the solution of the most important scientific and technical problems, which are being implemented in our republic. In 1984 alone the results of 1,657 works and developments were introduced, an economic impact of 1,105,000,000 rubles was obtained.

The increase of the quality of basic research, the increase of its purposefulness, the rapid bringing of the results up to the level of thoroughly checked developments, and the assurance of their large-scale use have already become a tradition of the scientific collectives of the republic Academy of Sciences. "

When becoming acquainted with the key provisions of the draft, you especially notice the thorough substantiation of party strategy on the questions of the further strengthening of the union of science and labor and the fundamental improvement of the creative contacts of researchers with production workers.

The institutions of the Ukrainian Academy of Sciences now maintain creative contacts with enterprises and organizations of 35 union and union-republic ministries, 20 ministries and departments of the Ukrainian SSR, and 10 ministries of other union republics. Tens of problems laboratories of 29 union and republic ministries, the activity of which is contributing to the acceleration of the practical implementation of the theoretical reserve for the solution of the most important national economic problems, are operating at the institutes of the academy. Now, when the policy of improving all the forms of the integration of science, technology, and production has been adopted in the country, precisely such an approach is of particular importance, since it makes it possible to advance scientific ideas much more actively into practice at large. The network of scientific production associations in industry is increasing significantly. Several years ago the Ukrainian SSR Academy of Sciences acted as the initiator of the establishment on the basis of large institutes, which have a developed pilot design and production base, of powerful scientific and technical complexes which are capable of solving promptly and at a high level the problems of the materialization of scientific ideas and the successful assimilation of innovations. Now six such collectives are operating at the academy.

The formation within them of problem-oriented subdivisions--engineering centers--was a qualitatively new step in this direction. The rapid development on the basis of the results of basic research of new advanced technologies, materials, equipment, and control systems and the assurance of their large-scale introduction and highly efficient use by production associations and enterprises are the goal of their activity. Several such engineering centers are already now in operation.

At the conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress the effectiveness of the

establishment of combined intersectorial scientific and technical centers was discussed. The question of organizing in the country an integral system of such complexes, including on the basis of the Institute of Electric Welding imeni Ye.O. Paton and the Institute of Problems of Material Science of the republic academy, is now being settled. The rapid development of the corresponding scientific and technical directions, the development of advanced equipment and technology at the level of the best world achievements, the training of personnel and the improvement of their skills, and assistance to sectorial ministries and departments in the efficient use of innovations remain their basic tasks. All of this is fully in keeping with the provisions of section V of the second part of the draft of the CPSU Program on the constant improvement of the organizational and economic forms of the integration of science and production and the management of scientific and technical progress.

The scientists of the Ukraine, like all the Soviet people, are striving to aid in every possible way the implementation of the set of scientific, technical, economic, and social measures outlined in the draft, which are aimed at the increase of the productivity of national labor and the increase of the standard of living of the workers. Particular emphasis is being placed on the development of fundamentally new technologies and equipment, which ensure radical changes in production. Thus, scientists of the Institute of Electric Welding imeni Ye.O. Paton in cooperation with organizations of the Ministry of Construction of Petroleum and Gas Industry Enterprises for the first time in world practice developed an advanced technology and high-performance equipment for the resistance welding of pipes of a wide assortment under field conditions. Their use made it possible to increase labor productivity by five- to sixfold, 1 unit like the K-700 under the conditions of the Extreme North frees about 100 welders. Here a high quality of operations is guaranteed, working conditions are made easier. A range of machines for the resistance welding of large-diameter pipelines has been proposed, comprehensive tests of them in various climatic zones have been conducted. The enterprises of the Ministry of the Electrical Equipment Industry have assimilated the series production of such equipment.

The technology of multiposition resistance welding, which made it possible to change radically the production of the crankcases of diesel engine blocks and the cooling heat sinks of heavy-duty power transformers, was developed. A line for the production of the bodies of diesel engines was developed on the basis of this technology at the Kolomna Diesel Locomotive Building Plant. Attended by 6 operators, it replaced the shop in which previously 300 welders worked. Labor productivity in the shop of the Zaporozhye Transformer Plant, in which a line for the multiposition welding of heat sinks was installed, increased by more than fortyfold. The economic impact for just these 2 enterprises exceeded 3 million rubles.

Another of the examples of the successful implementation in practice of the latest developments of our scientists is the development of the technologies of electroslag chill casting and electroslag centrifugal casting. The former method makes it possible to save 800 rubles per ton of castings. The latter is also highly efficient. Both of them have already been introduced in production at a number of Kiev machine building enterprises. For the purpose

of the large-scale introduction of these innovations an engineering center was established at the Institute of Electric Welding. A regional engineering center for electroslag technologies was established jointly with the Ukrainian SSR State Committee for Material and Technical Supply and the republic Academy of Sciences in the settlement of Kalinovka in the Kiev area.

The development at the Institute of Electric Welding imeni Ye.O. Paton on the basis of basic research of a new direction in the physical chemistry and technology of inorganic materials is also among the exceptionally important achievements. The coatings, which are being obtained as a result of this research, increase the overhaul life of the vanes of gas turbines for various purposes by 2.5- to 4-fold. In a number of ministries of the country they have already adopted these coatings as the basic version for their items.

Thus, the work of the scientists of the academy is being aimed to an ever increasing extent at the fulfillment of the demands of the party, which are reflected in the draft--to consistently pursue the policy of the improvement of working conditions, the decrease of the proportion of manual operations in social production, and the harmonious interaction of society and nature, man and the environment. The scientists of the republic will devote all their knowledge and creative energy to the complete accomplishment of these noble goals.

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